

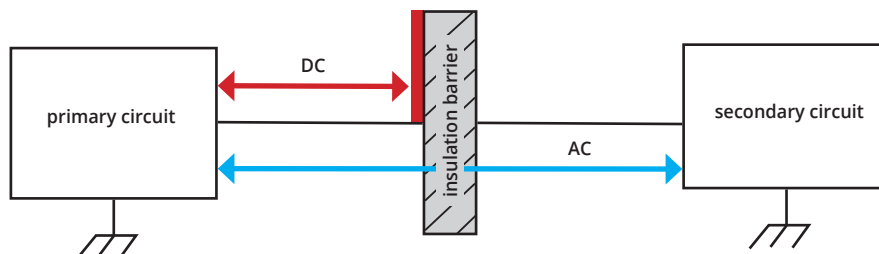
# GALVANIC ISOLATORS



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## What is galvanic isolation?

Galvanic isolation electrically isolates the circuits between two devices from each other without hindering the exchange of signals. The separation of the electrical potentials is created by a barrier made of a non-conductive material so that no electrical current can flow between the circuits.



This isolation barrier significantly reduces or prevents interference and damage in electrical systems that could otherwise be caused by various factors, such as potential differences, surges, noise or ground loops. Another important factor is the protection of persons from electric shock.

## Galvanic isolation in the network cable

### What can cause dangerous voltages in the network cable?

Particularly in copper-based network cabling, installation or design errors, aging processes or moisture can cause line cores or the cable shield to unintentionally establish an electrical connection to other live parts. In supply networks, high overvoltages can occur for short periods, so-called voltage transients.

### How does a network isolator work?

The network isolator creates a physical barrier that breaks all electrically conductive connections between the connected network peripheral and the connected device. In use, it provides reliable protection against DC and AC voltages of 4 kV and more, ensuring seamless operation of the network. In addition, it enables virtually lossless transmission of high-frequency AC voltages used in the Ethernet protocol for signal transmission, maintaining transmission quality.

### Where are network isolators usually used?

Network isolators are used in copper-based network connections in residential, public or commercial applications.



#### Medical technology

For patient protection against potentially hazardous leakage currents that can occur between a medical-electrical device when connecting to an Ethernet network or a non-medical device (PC or printer).



#### Measuring and monitoring systems

Sensitive devices in electrical test fields that are connected to a control station via Ethernet interfaces must be protected against interference voltages and potential differences.



#### Computer systems

For computer systems that are galvanically connected to each other over long distances via Ethernet cabling and where potential equalization currents are to be prevented.



#### Valuable equipment and equipment requiring protection (general)

Applications where valuable equipment or equipment requiring special protection must be protected from hum and overvoltages from the network periphery.

### When is the use of a network isolator not recommended?

The network isolator has a specific frequency bandwidth of 0.3 MHz to 100 MHz for data transmission. Frequencies outside this bandwidth experience significant attenuation. Therefore, signals from **nurse call systems, PBX systems, and analog audio or video signals** cannot be transmitted sufficiently via the network isolator.

#### Important:

**A cable route connected to a network isolator cannot be used to supply power to PoE (Power over Ethernet) end devices!**

## Galvanic separation in medical technology

### What defines a medical electrical device or system?

The definition of medical electrical (ME) equipment is determined by the international standard IEC 60601-1. The function of an ME device is to support diagnostic, therapeutic, care or monitoring measures for patients. The term „medical-electrical system“ describes the cooperation of several devices, at least one of which must by definition be a medical-electrical one. The individual components of the ME system can communicate with each other both wired and wirelessly.

### Why do medical electrical systems need network isolators?

ME devices pose a high safety risk to the patient due to their proximity. Electrical currents that pass to the person via the electrically conductive parts of the device can lead to life-threatening situations. To eliminate any risk that could endanger a person, the international standard IEC 60601-1 regulates the requirements for the electrical safety of ME equipment and ME systems. As a general rule, all electrical equipment - including non-medical equipment - located in the immediate vicinity (1.5 m radius) of the patient or connected to other equipment in the patient environment must comply with the electrical safety requirements of the German standard DIN EN 60601-1. To achieve compliance with the standard, ME devices and ME systems that are connected to other devices or networks via signal interfaces such as Ethernet, RS232 or USB must have galvanic isolation devices in the supply lines. Among other things, the standard requires that all live lines leading to the device from an electrically unprotected area must be connected via a disconnecting device.

ME devices must have a galvanic isolator at their Ethernet interface. If this is not integrated at the factory, the use of a network isolator is required. This also applies if an Ethernet interface on an ME device is intended exclusively for connection to other ME devices and therefore does not have its own galvanic isolation. In cases where the Ethernet interface is connected to a non-ME device (e.g. to a printer), a network isolator must also be interposed.

### What is MOPP?

MOPP is the abbreviation for **M**eans of **P**atient **P**rotection and is defined in the IEC 60601-1 standard as a „measure to reduce the risk of electric shock to the patient“. Medical devices must be equipped with two independent protective measures for patient protection in the event that one of them fails.

Here, several protection systems usually act in parallel or in combination to counteract different hazard potentials. The voltage values required by a network isolator are defined in 1 MOPP and 2 MOPP:

<b>1 MOPP</b>	125 VAC	250 VAC	400 VAC	<b>2 MOPP</b>	125 VAC	250 VAC	400 VAC
<b>Dielectric strength</b>	<b>1,5 KV</b>	<b>1,5 KV</b>	<b>1.8 KV</b>	<b>Dielectric strength</b>	<b>3 KV</b>	<b>4 KV</b>	<b>4.6 KV</b>
Clearance in air	1.6 mm	2.5 mm	3.5 mm	Clearance in air	3.2 mm	5.0 mm	7.0 mm
Creepage distance	3.0 mm	4.0 mm	6.0 mm	Creepage distance	6.0 mm	8.0 mm	12.0 mm
Insulation system	basic insulation			Insulation system	reinforced insulation		

The number of protective measures that a network isolator offers in individual cases depends on its technical properties and the specific medical application scenario. For example, a blood pressure monitor has different requirements than a pacemaker in an operating theatre. In addition, a network isolator only has to offer both protective measures if the medical device to be protected is not already equipped with a protective measure.

### Is it possible to connect several network isolators in series?

In environments with increased risks such as operating theatres, it may be advisable to equip both the medical device and the wall outlet with a galvanic isolation device. In other cases, medical devices that already have a galvanically isolated network interface may need to be operated on wall outlets that are also galvanically isolated. Such a configuration is normally harmless, as our network isolators do not usually significantly affect the signal strength and quality.

### Can a network isolator be used in a PoE network?

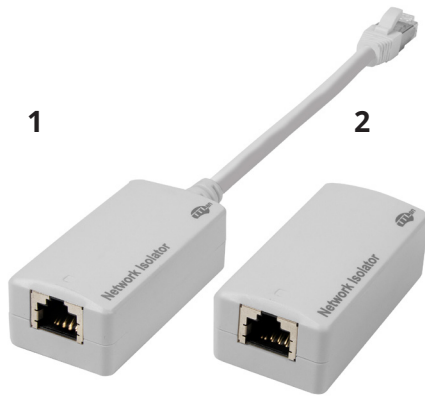
A network isolator can be easily integrated into a PoE network without negatively affecting its functionality or structure. However, it should be noted that PoE end devices cannot be supplied with power via the network isolator due to the galvanic isolation. There are two possibilities for operating PoE devices: Either the network isolator is removed from the line or the PoE device is supplied with power via a separate, possibly medical power supply unit.

### Which types of network isolators can you order from us?

We stock various network isolators with RJ45 or USB interface, for DIN rail mounting or in keystone format. All products are TÜV-tested and comply with the IEC 60601-1-2MOPP standard.

**Not the right one for you? We would be pleased to procure other solutions for you as desired.**

# RJ45 NETWORK ISOLATORS



## + Advantages

Galvanic isolation in Ethernet networks

Potential difference protection up to 6 kV AC / 8.5 kV DC

Ethernet transmission up to 10 Gbps

EN 60601-1 2MOPP compliant

UL E527040

## RJ45 Network Isolators

Interfaces:	RJ45 socket / socket, RJ45 socket / plug, plastic housing, cable 20 cm, colour: white
Transmission:	10 Gbps
Standards:	EN 60601-1 2MOPP, UL E52704, ISO11801, Cat.6A
Protection:	Equipment, Ethernet data pairs, potential differences up to 6 kV AC / 8.5 kV DC
Temperature range:	-10°C up to 60°C (operation)
Mounting:	Wall or top-hat rail TH35 (mounting accessory on page 5)
<b>Art. No.</b>	<b>#1: 1502-1-0,20M #2: 1502-1</b>



## + Advantages

Compact keystone housing, space-saving design

Potential difference protection up to 6 kV AC / 8.5 kV DC

Ethernet transmission up to 10 Gbps

EN 60601-1 2MOPP compliant

UL-listed E527040

## Keystone RJ45 Network Isolators

Interfaces:	RJ45 socket / socket, RJ45 socket / plug, plastic housing, cable 20 cm, colour: white
Transmission:	10 Gbps
Standards:	EN 60601-1 2MOPP, UL E52704, ISO11801, Cat.6A, Class EA
Protection:	Equipment, Ethernet data pairs, potential differences up to 6 kV AC / 8.5 kV DC
Temperature range:	-10°C up to 60°C (operation)
Mating cycles:	~750 (plug / socket)
<b>Art. No.</b>	<b>#1: 1502-2-0,20M #2: 1502-2</b>

**Note: All of these network isolators are NOT PoE compliant!**

# USB ISOLATOR



## + Advantages

High dielectric strength signal and shielding

USB Full Speed transmission up to 12 Mbps

EN 60601-1 2MOPP compliant

UL, IEC, and FCC certified

UL E527040

## Specification

Interfaces Master:	1x 5V USB-B + 1x 5V DC
Interface Slave:	USB 2.0 socket
Housing:	Plastic, colour white
Transmission:	USB Low Speed (1.5 Mbps) / USB Full Speed (12 Mbps)
Standards:	UL/IEC: 60601-1; 60601-1-2; 2MOPP, FCC Part 18 certified, IP30
Network:	IEEE 803.2 from 10/100/1000-BaseT, Twisted-Pair, auto-conf. (behaves transparently in the network)
Dielectric strength:	Signal and shielding 6000V (1 minute)
Power supply:	USB + 5V @ 250mA (max.) (isolated)
Temperature range:	0°C up to +40°C
Mounting:	Wall or top-hat rail TH35 (see mounting accessories , below)
<b>Art. No.</b>	<b>2724</b>

# ACCESSORIES



## Bracket for DIN Top-Hat Rail mounting

Suitability:	Network isolators 1502-1-0,20M, 1502-1, USB isolator
DIN rail:	TH35
<b>Art. No.</b>	<b>1502-1-DM</b>



## Power Cord

Suitability:	USB Isolator
<b>Art. No.</b>	<b>2724-PSU</b>

# WHAT SETS US APART



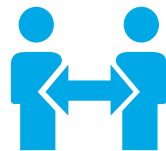
## FAMILY-RUN & MEDIUM-SIZED

We are fast and flexible in decision-making, personally available and see the business as a long-term partnership.



## CUSTOMER-SPECIFIC

We fulfil wishes: With over 1000 tools for OEM and 10,000 technical sketches, we are able to offer solid customised solutions.



## STRONG NETWORK

We have known our partners for a long time and value them. We have access to original connectors from all well-known manufacturers or, on request, low-priced compatible products with guaranteed stable quality.



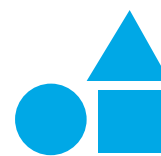
## SOLUTION-ORIENTED

With established and structured processes and personal service we find the best technical and economic solution for your request.



## 100% QUALITY-TESTED

All our cable assemblies are 100% electrically tested before delivery and the production facilities can be audited at any time.



## ALWAYS FLEXIBLE

Flexibility from small to large series through production facilities in Asia and Eastern Europe.



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